BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19) Patent Office of Japan (JP) (11) Publication of Patent Application

(12) **JAPANESE PATENT APPLICATION**

Showa 52-33181

(51) Int. CL. 5 ID Code Office Cont'l No. (43) Publication: Showa 52 (1977) 8/26

A 23 L 1/212 34 D 0 7258-49

Number of claims of the invention: 1

Number of pages (total of 6)

---

(54) Name of the invention: Skin Peeling Treatment Method for Fruits and Vegetables

(21) Filed Number: Showa 47-72318

(22) Filed Date: Showa 47 (1972) 7/19

Patent Assignee: Kao Sekken (Soap) K.K.

JP 52-33181

Note: Names, addresses, company names and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified by a numeral prefix or a general form of plurality suffix.

(54) Skin Peeling Treatment Method for Fruits or Vegetables

(57) Scope of the claims of the invention

1. Skin peeling treatment method for fruits and vegetables, characterized by the fact that the fruits or vegetables are immersed in an acidic water solution or an alkali water solution, obtained as in the range of 0.01 ~ 1.0 weight % of one type or two or more types of nonionic surface active agents from the group consisting of polysugar aliphatic acid esters, sorbitane aliphatic acid esters, polyoxyethylene sorbitane aliphatic acid esters and glycerin aliphatic acid esters, and in the range of 0.01 ~ 1.0 weight % of citric acid or citric acid salt, have been added; and after that, water washing and peeling treatments are conducted.

Detailed explanation of the invention

The present invention is an invention about a method for the chemical skin peeling treatment method of fruits and vegetables.

Regarding the fruits and vegetables, besides being eaten fresh, there are many cases where they are processed so that they are canned, bottled, and made into refrigeration food products, and at the time of the manufacturing of such processed products, there are many cases where a skin peeling treatment is necessary.

In the past, as the skin peeling treatment method used in this type of technological processing, the following methods have been used: (1) the method called the hot water scratching method or the hot water peeling

method, namely the method where the fruits or vegetables are exposed to hot water or steam and the fruit peeling is damaged and the skin is peeled, (2) the alkali skin peeling method where the fruits and vegetables are immersed in a hot alkali solution, (3) the acid skin peeling method where the fruits and vegetables are immersed in a heated acidic solution, (4) the skin peeling method where both an acid and an alkali are used, and (5) the skin peeling method where an enzyme such a pectin degrading enzyme, is used. However, in the case of the method (1) a long time is necessary, and this causes the sugar content, the flavor, the vitamins, etc., inside the fruit, to be leached out, and there are many cases where quality of the inside of the fruit is decreased, and also, even with that the skin peeling is insufficient, and this decreases the processing window of the mass production. In the case of the methods (2) and (3), compared to the method (1), it is possible to complete the treatment within a shorted period of time, however, by the strong effect of the chemicals, the inside of the fruit is shrunk, and not only the skin part, but also the part inside the fruit, is degraded and changes color, and there is skin chapping, destruction of the inside, an excessive degree of skin removal, and because of that, a decrease of the processing feasibility and the quality occurs. If the processing and the quality are considered and the treatment concentration and treatment temperature are decreased, the skin peeling treatment time becomes excessively long, and it then it becomes a method that has also the drawbacks of the warm peeling. Regarding the method (4), compared to the methods (2) and (3), the unfavorable circumstances where the inside of the fruit is damaged, are decreased, however, as a whole, including the time for the water washing, the treatment time becomes long, and because of that, a large amount of leaching out of the sugar content, the flavor, the vitamins, etc., in the fruits occurs, and the quality of the fruit is decreased, and as a result, it also leads to results where the manufacturing efficiency is low. In the case of the method (5), a long time period is necessary as the time for the action, and the used method is also not easy, and it is also expensive, and because of that, there are problems from a practical point of view, and depending on the case, it affects not only the skin of the fruit, but also the inside part of the fruit, and skin chapping, destruction of the inside part occur.

Regarding the present invention, it is an invention that has taken into consideration the methods according to the previous technology, and it has as a goal to increase the processing feasibility and the quality, and to design for an increase of the economical properties of the technological process and an increase of the manufacturing feasibility properties, etc.

Namely, the present invention is a skin peeling treatment method for fruits and vegetables, characterized by the fact that the fruits or vegetables are immersed in an acidic water solution or an alkali water solution, obtained as in the range of 0.01 ~ 1.0 weight % of one type or two or more types of nonionic surface active agents from the group consisting of polysugar aliphatic acid esters, sorbitane aliphatic acid esters, polyoxyethylene sorbitane aliphatic acid esters and glycerin aliphatic acid esters, and in the range of 0.01 ~ 1.0 weight % of citric acid or citric acid salt, have been added, and after that, water washing and peeling treatments are conducted.

Regarding the fruits that are the subject of the present invention, they can be apples, tangerines, peaches, apricots, loquats, grapes, pears, figs, persimmons, chestnuts, etc., and the vegetables that are subject of the present invention can be tomatoes, cucumbers, daikon, potatoes, etc.

Regarding the nonionic surface active agent that is added according to the present invention to the acidic or alkali water solution, it is polysugar aliphatic acid ester, sorbitane aliphatic acid ester, polyoxyethylene sorbitane aliphatic acid ester and glycerine aliphatic acid ester.

Also, as the polysugar aliphatic acid ester used according to the present invention, especially, monoesters and diesters are appropriate, and the number of the carbon atoms in the aliphatic acid part of the ester is approximately in the range of 8 ~ 22, and preferably, it is in the range of 12 ~ 18. For example, they can be saturated aliphatic acids, like lauric acid, myristic acid, palmitic acid, stearic acid etc., and they can be unsaturated monoaliphatic acids of the palmitooleic acid, oleic acid and ricinoleic acid etc., or of their mixtures. Besides these, it is also possible to use monoesters or diesters of the mixed aliphatic acids obtained from natural glyceride oils and fats.

The number of the carbon atoms in the aliphatic acid part of the sorbitane aliphatic acid esters, and the glycerine aliphatic acid esters is approximately in the range of 6 ~ 22, and preferably, it is in the range of 10 ~ 18. As the polyoxyethylene sorbitane aliphatic acid ester, compounds are used that are obtained as to a sorbitane aliphatic acid ester that is derived from aliphatic acid where the number of the carbon atoms is in the range of 8 to 22, approximately 5 to 35 moles of ethylene oxide is adducted.

According to the present invention, for the nonionic surface active agent, it is also a good option to use a combination of two or more types of materials.

The nonionic surface active agent is used as it is combined with citric acid or citric acid salt. Regarding the citric acid salt, sodium citrate, potassium citrate, etc., are effective.

Moreover, together with the nonionic surface active agent and the citric acid or the citric acid salt, depending on the requirements, then, it is also a good option if a small amount of an appropriate additive agent, for example, sodium chloride, sodium sulfate, sodium borate etc., inorganic builders, gluconic acid, malic acid, oxalic acid, tartaric acid, lactic acid, etc., organic acids or their salts type materials, amino acid type materials, and sodium salt of ethylene diamine tetraacetic acid, etc., quality improvement additives. Also, in the case when the composition material which contains the nonionic surface active agent and the citric acid or the citric acid salt, is used as it is added in a solution form, it is possible that they are dissolved in water and a solubilization agent, for example, ethanol, glycerine, propylene glycol, etc., monovalent or polyvalent low homologous order alcohol type materials.

Regarding the amount added of the nonionic surface active agent and the citric acid or the citric acid salt, it is used so that relative to the acid or the alkali water solution, the nonionic surface active agent is in the range of 0.01 ~ 1.0 weight %, and the citric acid or the citric acid salt is used in an amount in the range of 0.01 ~ 1.0 weight %. If an amount that exceeds this range is used, the bubbling becomes excessive and it interferes with the operational properties, and also, it is not efficient from an economical point of view, and because of that, these options are not preferred. On the hand, if it is added in an amount that is less than 0.01 weight %, a sufficiently satisfactory effect is not obtained.

Regarding the concentration of the acid or the alkali, the treatment temperature, the treatment time, these can be adjusted and controlled depending on the subject material. For example, in the case of the treatment of chestnuts, the acid concentration is approximately 15 %, in the case of tangerines, it is appropriate that the concentration is approximately in the range of 0.3 ~ 0.8 %. And regarding the alkali concentration, in the case of for example, peaches, it is appropriate to be in the range of approximately 3 ~ 5 %, and in the case of tangerines, it is appropriate to be approximately 0.6 %.

Usually, as an acid, hydrochloric acid is used, and as an alkali, caustic soda can be used.

According to the present invention, even if non-ripened fruits are mixed and present, they can be skin peeled the same way as in the case of the ripened fruits, and it becomes possible to eliminate a selection technological process and the processing efficiency is increased.

Also, because of the fact that the surface active agent that is used according to the present invention is a nonionic type surface active agent, the absorption properties relative to the subject material, are small, and the danger that it is left onto the subject material, is small, and it is possible to be easily eliminated by washing with water for a short period of time.

The existing reasons for the effect of the present invention are not clear, however, it is considered that, surprisingly, the used according to the present invention polysugar aliphatic acid ester, sorbitane aliphatic acid ester etc., surface active agent, and citric acid or citric acid salt, have an synergistic effect, and they improve the solubility properties of the protopectin, pectin, hemicellulose etc., that are in the fruit skin, the destruction of the structure is accelerated and at the same time, the alkali immersion wetting properties are aided, and the effect relative to the structure is accelerated.

After that, practical implementation examples according to the present invention, will be shown. The % that are quoted throughout these practical examples have the meaning of weight %.

Practical Example 1

Compounded products that are formed correspondingly from 10 % polysugar lauric acid monoester and 10 % of 1 type of material that is selected from the group of materials that are shown according to the presented here below Table 1, and 80 % water, were tested for their skin peeling properties relative to apples (National Glory).

Namely, in a water solution containing 10 % caustic soda, and 5 % ethanol, 0.2 % of the experimental compounded product was added, and after that, the apples were immersed in this solution for a period of 5 minutes at a temperature of 60oC, and the skin peeling treatment, was conducted. After

the treatment, the surface area of the surface where the skin of the fruit remained, was measured by using a planimeter, and this value was divided by the total surface area, and by that the skin peeling coefficient, was obtained. These results are shown in Table 1.

Table 1: Combined use effect of polysugar lauric acid ester and different types of experimental compounds

	Accompanying Experimental Compounds	Skin Peeling Coefficient (%)
Reference Examples	No addition (blank)	44.8
	Glycine	47.2
	Alanine	45.5
	Gluconic acid	58.0
	Oxalic acid	51.0
	Sodium tartarate	64.3
	Sodium succinate	52.1
	Sodium maleate	57.1
	Sodium fumarate	50.3
	Sodium lactate	51.6
	Sodium glutaminate	46.3
Practical Examples	Citric acid	85.5
	Sodium citrate	86.7
	Potassium citrate	87.2

Practical Example 2

To a water solution containing 10 % caustic soda, 0.2 % of mixed materials containing polysugar aliphatic acid ester (product trade name Nitsuto Ester PW 1590, manufactured by Dai Nippon Seisho K.K.) and sodium citrate at

different mixing ratios, were added, and then after that, apples (National Glory) were immersed in the solution for a period of 5 minutes at a temperature of 60oC, and then the skin peeling treatment was conducted. After the above described treatment, by using the same method as the one described according to the presented here above Practical Example 1, the skin peeling coefficient, was obtained. These results are shown in the Table 2, below.

Table 2

Compounding Ratio (%)		Skin Peeling Coefficient (%)
Polysugar aliphatic acid ester	Sodium citrate	
100 : 0		46.3
90: 10		63.5
80 : 20		78.7
50 : 50		86.5
20 : 80		82.0
10 : 90		77.4
0 : 100		41.0

As it is clear from the results presented in Table 2, the polysugar aliphatic acid ester and the sodium citrate, in this wide range of mixing ratios, has excellent skin peeling results that have not been achieved by other compounds.

Practical Example 3

As the nonionic surface active agent, polysugar palmitic acid ester, polyoxyethylene (20) sorbitane monolaurate, sorbitane monolaurate, were used, and the above described surface active agent was used together with sodium citrate and the skin peeling treatment of peaches, was conducted.

(i) Skin peeling time

One can of harvested in the Yamagata Prefecture peaches (yellow peaches), 260 ~ 270 grams, were used, and these were immersed for a certain period of time in a treatment solution obtained as to a maintained at a temperature of 80 ~ 85oC aqueous solution of caustic soda (3 % and 5 %) the predetermined amount of the chemical agent, has been added, and these were then washed with water, and after that the state of the elimination of the skin, was observed, and the results were evaluated. These results are presented in table 3 and table 4, as the immersion time required for the complete elimination of the skin.

Table 3: Case when a 3 % caustic soda aqueous solution is used

Added amount of chemical (%)			Time necessary for the complete elimination of the skin (s)
Reference Examples	No addition		55
	Sodium dodecylbenzene sulfonate	0.2	40
	Polysugar palmitic acid ester	0.1	45
	Polysugar palmitic acid ester	0.2	40
	POE (20) sorbitane monolaurate	0.2	40
Practical Examples	Polysugar palmitic acid ester Sodium citrate	0.02 0.1	32
	Polysugar palmitic acid ester Sodium citrate	0.1 0.1	25
	POE (20) sorbitane monolaurate Sodium citrate	0.1 0.1	30
	Sorbitane monolaurate Sodium citrate	0.1 0.1	30

Table 4: Case when a 5 % caustic soda aqueous solution is used

Added amount of chemical (%)			Time necessary for the complete elimination of the skin (s)
Reference Examples	No addition		35
	Sodium dodecylbenzene sulfonate	0.5	23
	Polysugar palmitic acid ester	0.5	25
	POE (20) sorbitane monolaurate	0.5	25
Practical Examples	Polysugar palmitic acid ester Sodium citrate	0.05 0.1	15
	Polysugar palmitic acid ester Sodium citrate	0.1 0.1	12
	POE (20) sorbitane monolaurate Sodium citrate	0.1 0.1	15
	Sorbitane monolaurate Sodium citrate	0.1 0.1	16

(ii) Skin peeling temperature

In a 3 % aqueous solution of caustic soda maintained at a certain temperature, the predetermined amount of the chemical agent is added, and then the peaches are immersed for a period of 30 seconds, and they are washed with water, and after that the state of the elimination of the skin is observed, and the results are evaluated. These results, expressed as the solution temperature that is required in order to completely eliminate the skin, are according to the presented in Table 5.

Table 5

Added amount of chemical (%)			Solution temperature necessary for the complete elimination of the skin
Reference Examples	No addition		95oC
	Sodium dodecylbenzene sulfonate	0.5	85
	Polysugar palmitic acid ester	0.1	90
	Polysugar palmitic acid ester	0.5	88
	POE (20) sorbitane monolaurate	0.5	80
Practical Examples	Polysugar palmitic acid ester Sodium citrate	0.05 0.1	80
	Polysugar palmitic acid ester Sodium citrate	0.1 0.1	78
	POE (20) sorbitane monolaurate Sodium citrate	0.1 0.1	78
	Sorbitane monolaurate Sodium citrate	0.1 0.1	80

iii) Tests regarding the conditions of the alkali elimination

The peaches that have been taken out of the alkali solution were placed in a 1 l Beacher, and they were washed by water from a water pipe at a constant rate, and then the water was let to overflow, and the change of the pH of the solution was monitored, and at the same time, a measurement of the amount of the alkali, was conducted. The treatment conditions and the results are presented in the Table 6, here below.

Table 6

Treatment Conditions		Time until the pH becomes 8	State of the inside of the fruit	Amount of caustic soda in the 1 minute solution flow
Reference Examples	5 % aqueous solution of caustic soda 30 seconds immersion	4 minutes, 36 seconds	Somewhat alkali burned	74 mg
Practical Examples	Aqueous solution containing 5 % caustic soda, polysugar palmitic acid ester 0.1 %, sodium citrate 0.1 %, immersion time 15 seconds	2 minutes 15 seconds	Good	45 mg

According to the present invention, even the amount of the adhered caustic soda is small, and the time for the water washing is also shortened.

Practical Example 4

By using the following here below chemical agents A, B, C, D and E, a skin peeling treatment of the inside skins of tangerines was conducted, and these results were studied.

Namely, in advance, the outer skin of tangerines (size M, Wakayama prefecture), was subjected to a treatment by using hot water at a temperature of 90oC for a period of 1 minute. After that, it was manually peeled off, and the fruit was selected and after that the fruit seeds were manually separated, and then they were mixed and unified and this was used as the experimental material for the studies. 500 grams of this experimental material was weighed and it was placed into 1 liter of a solution of 0.5 % of hydrochloric

acid solution or a solution where to that 0.1 % of the skin peeling chemical agent, has been added. Then, this was treated for a period of 30 minutes at a temperature of 30oC.

After the treatment, it was washed with water by a flow of water for a period of 5 minutes, and after that, it was placed in 1 liter of a 0.4 % caustic soda aqueous solution or solution where to that 0.1 % of the skin peeling chemical agent, has been added. This was then treated for a period of 20 minutes at a temperature of 26oC. After the treatment, it was water washed by a water flow for a period of 5 minutes, and then it was taken out and withdrawn, and the it was separated into three parts – complete skin elimination of the inner skin – incomplete skin elimination – broken, and the weight amount of each of these groups was measured. When the percentage of this weight ratio, is shown, the results are according to the presented here below in Table 7.

Table 7

Experimental chemical agents *		Complete skin elimination (%)	Incomplete skin elimination (%)	Broken (%)
Practical Example	A	84.0	14.1	1.9
	B	85.8	12.2	1.0
Reference Example	C	67.5	30.3	2.2
	D	65.3	32.6	2.1
	No addition	60.9	38.0	1.1

- Notes)

The experimental chemical agent A is a compounded material obtained from polysugar myristic acid ester 3 : sodium citrate 2

The experimental chemical agent B is a compounded material obtained from polysugar myristic acid ester 2 : sodium citrate 3 .

The experimental chemical agent C is sodium dodecylbenzene sulfonate

The experimental material D is only polysugar myristic acid ester

As it is clear from the results presented in Table 7, according to the present invention, the complete skin elimination coefficient is increased.

Practical Example 5

Tomatoes (Aichi prefecture product where 1 tomato is approximately 180 g) were immersed for a period of 15 seconds in a treatment solution at a temperature of 80oC, and then they were water washed, and after that, the state of the skin and the state of the inside of the tomatoes, were observed. The composition of the used treatment solution and the practical experimental results are shown in the Table 8, presented here below.

Table 8

Treatment Solution		Skin elimination state **	State of the inside of the material
Reference Examples	4 % caustic soda aqueous solution polysugar palmitic acid ester 0.1 % 1 % caustic soda aqueous solution	O O	Significant surface destruction good
Practical Examples		O	good
	POE (2) sorbitane monolaurate 0.1 % Sodium citrate 0.1 % 1 % caustic soda aqueous solution	O	good
	Glycerine caprinic acid ester 0.05 % Polysugar palmitic acid ester 0.05 % Sodium citrate 0.1 % 1 % caustic soda aqueous solution	O	good

** Notes) Symbols representing the state of the skin elimination

O : complete skin elimination (90 ~ 100 % skin elimination)
O : almost complete skin elimination (75 ~ 90 % skin elimination)

Patent Assignee: Kao Sekken K.K.

Translated by Albena Blagev ((651) 735-1461 (h), (651) 704-7946 (w))

2/20/2000